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ABSTRACT

After a review of the literature on cognitive "cause maps" in organizational decision-making, this study describes a midwestern elementary school from the perspective of individual sensemaking, captured through individual cognitive maps of cause-effect relationships. Data were collected with an adaptation of Bougon's (1983) Self-Q interviewing technique, in which respondents first ask themselves questions, then verify key concepts drawn from the questions, and finally indicate the causal relationships among the most important concepts and the nature of those relationships. Creating the individual cause maps involved moving from a broad, holistic assessment of the cause map to the delineation of subparts. At each stage, causal findings were interpreted against the substantive content of the concepts evoked by the individual respondent. Examples are drawn from four individual case studies of first-grade teachers, and findings are summarized with regard to the nature of the concepts used by the teachers, their perceived level of influence, the utility of examining the causal structure of individual maps, and the systematic structural differences across individuals on some critical dimensions not fully examined to date. Appended are tables of key concepts with teachers' definitions, references, and individual case studies of the four teachers. (TE)

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# Making Sense of Schools as Organizations:
# Cognition and Sensemaking in Schools

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Making Sense of Schools as Organizations:
Cognition and Sensemaking in Schools

The recognition by researchers and analysts that individual cognitive processes are relevant organizational phenomena has come slowly. Barnard's (1938) prescient observations about individual subjective responses to managerial authority and the role of interpersonal communications in creating and sustaining organizational cohesiveness demonstrated in a particularly cogent fashion the social nature of organizational reality. Forty years later the field of organizational analysis is just beginning to grapple seriously with the role of the individual in organizations. Benson's (1977) "crisis" in organizational analysis reflects in part a growing awareness of the importance of microlevel phenomena in structuring the macrolevel features of organization. Benson highlights work from phenomenological, ethnomethodological, and Marxist perspectives which assert the preeminence of the individual's subjective perceptions in creating organizational reality. From a social psychological perspective Weick (1979) arrives at a similar conclusion (see also Louis, 1980). Weick describes organization as a process of organizing in which individual behaviors are interlocked among two or more people (1979, p. 89). Weick goes on to state that "The four elements of organizing are ecological change, enactment, selection, and retention" (1979, p. 130). These four elements, linked together, form Weick's basic "recipe" for individual sensemaking. Recent efforts to enlarge our understanding of individual cognitive processes in organizing have focused on (1) describing individual cognitive schema and their link to individual behavior, and (2) identifying collective cognitive structures as "keyholes" for tapping the shared social realities, values, and norms that somehow create organization (Douglas,

1986; Sims, Jr., Gioia, and Associates, 1986; Bougon, Weick, & Binkhorst, 1977).

The study reported herein is an effort to describe a single organization--an elementary school--from the perspective of individual sensemaking. In this case, sensemaking was captured through the construction of individual cognitive maps of cause-effect relationships or "cause maps". The significance of this study is threefold. First, it builds on and extends our knowledge of individual sensemaking in organizations. Second, it contributes to the increasing sophistication with which cause-map data are collected, aggregated, and interpreted. Third, it applies the notion of individual cognition in a new organizational context, the school. Studies of schools as organizations have tended to emphasize either the anomalous characteristics of these organizations (Weick, 1976; 1982; Firestone & Wilson, 1985; Cohen, March, & Olsen, 1972; Lutz, 1982; Furman, 1987) or the effectiveness of bureaucratic mechanisms and strategies in achieving desirable goals (Clark, Lotto, & Astuto, 1984; Mackenzie, 1983; Peterson, 1984). Descriptions of school organizations from the perspective of individual sensemaking provide a basis for extending our understandings of schools and informing theories of educational administration. Looking at schools is advantageous from the point of view of the literature on cognition as well. To date, primary attention has been given to managerial sensemaking and cognition only in studies of management strategy (Billings & Suarez, 1987; Ford & Hagarty, 1984; Ginsberg, 1987; Lyles & Schwenk, 1987). This study of cognition and sensemaking in an elementary school provides a needed richness and diversity to the field. For the first time individual cause maps of non-managerial participants are collected and compared. This vision of organizational reality is startling in its diversity and intriguing in its complexity.

In the sections to follow we review relevant research on individual and collective sensemaking and causal mapping, identify relevant methodological and theoretical issues, describe the data collection and analysis procedures, and present key findings and conclusions. Our intention is to address the contributions of this study to the methodology of causal mapping and to provide the reader with a sense of the organizational reality that emerges when a school is described from this theoretical orientation.

## Cognition and Causal Mapping: The State-of-the-Art

"Sensemaking" is a term that describes the process whereby individuals attend to certain phenomena or variables more than others, such that they punctuate or punch out certain facets from complex streams of experience. As individuals build causal chains around these critical variables, they create cause maps which link the variables in ways that are meaningful and sensible to the individuals (Frost & Hayes, 1978; Weick, 1979). Cause maps convey the meanings attributed to social territories by individual participants in those territories. The causal relations displayed in a cause map are the necessary basis for the construction of plans and the initiation of behaviors directed at desirable endstates (Axelrod, 1976; March & Simon, 1958). The summary of sensemaking is the cause map, which becomes the context wherein one's activities make sense (Bougon, 1983).

There is a small but growing body of research in which cause map data are used to understand organizational phenomena. Demonstrating empirically what had been theoretically asserted has been both rewarding and challenging. Researchers have created cause maps for both individuals and organizations. Methods of creating cause maps and analyzing cause map data have been developed and refined. Two early landmarks provided the impetus for much later work by demonstrating the efficacy of this approach and providing some methodological strategies for using it. The first of these

two is Robert Axelrod's (1976) compendium of studies of foreign policy decisions and decision makers. It marks one strand of research in this area--studies of individual manager's epistemological structures brought to bear on decision making, problem sensing or identification, or related strategic issues. The second study, Bougon, Weick, and Binkhorst's (1977) investigation of the Utrecht Jazz Orchestra (UJO), marks a second strand focusing on collective cognition and the development of collective cause maps.

These two studies set the parameters for much of the subsequent work. Axelrod and his colleagues were able to link cause maps to decision makers' causes of action by creating cause maps from secondary source materials "left behind in the normal course of decision making" (1976, p. 6). Their substantive focus on managerial epistemology no doubt spurred on other analysts, who saw in causal mapping a way to both understand and improve managerial strategy through a more realistic approach to individual cognition. Ford and Hegarty's (1984) explanatory study of managers' beliefs about structure was clearly in this tradition.

> Contemporary organizations face turbulent environments that require frequent adaptive decisions in order to survive. These decisions must be made, in part, on the cause/effect maps that decision makers use as a basis for evaluating various options they have available. (1984, p. 290)

Bougon, Weick, and Binkhorst (1977) gave inquirers some analytic tools for interpreting cause map data. Their primary focus was on ordering or "unfolding" the cause map.

> There is a need for a theory and a method that will allow us to "unfold" the data into a type of cause map that will order the

> variables along a flow of causality. We shall call such a construction or unfolding an etiograph... (1977, p. 611)

The etiograph orders the variables according to the number of causal paths flowing in to the variable (indegrees) and the number of causal paths flowing out from the variable (outdegrees). In their analyses these researchers found that when the variables were ranked by indegrees they corresponded to what appeared to be givens, means, and ends.

The notion that variables clustered by type in the causal flow of an ordered cause map reappeared in studies by Roos and Hall (1980) and Ford and Hegarty (1984). The former researchers found that policy variables were grouped to the left in the causal flow, intervening variables in the middle, and utilitarian program values to the right. In the latter study Ford and Hegarty found contextual variables grouped to the left, structural variables in the middle, and performance variables to the right. These findings have led researchers to suggest that the overall pattern of causality is more important in understanding organizations than the concepts or variables which make up a cause map.

> The empirical results of this study provide a first positive test of the proposition that in a social structure it is not the objective content of the variables, but the structure of causality among them that determines the fate of the system. (Bougon, Weick, Binkhorst, 1977, p. 626)

> The behavior of a social system does not depend on the content of its nodes...The behavior of a social system depends solely on the topological properties reflected in its composite map. (Bougon & Komocar, 1987, p. 26)

The need for content-free analysis is even clearer at the individual level, since the "nodes are codes" (Weick & Bougon, 1986, p. 113); that is, they are labels that individuals attach to concepts.

> Only the speaker can know for sure what any concept means, and investigators impute meaning at the risk of misinterpretation... [M]eaning does not reside in the labels attached to concepts. Instead meaning lies in the map itself--that is, the larger pattern among the other labels to which a specific label is linked and between these other labels and the specific label. Only the speaker can know for sure what any concept means... (Weick & Bougon, 1986, p. 113)

Thus, the most valid techniques for creating cause maps seem to be those in which the concepts are labelled with the respondents' own language (see Gronhaug & Falkenberg, 1987). Axelrod (1976) relied solely on secondary source materials which avoided intrusions from the researcher's assumptions but were clearly not sincere representations of the respondents' subjective epistemology. Personal interviews such as those conducted with members of the Utrecht Jazz Orchestra (Bougon, Weick, Binkhorst, 1977) improved sincerity but increased the likelihood that the researchers' views had intruded in the give and take of personal interaction. Bougon's (1983) solution is the Self-Q technique in which individual respondents ask themselves questions. The concepts are extracted from the questions, thus preserving the respondent's language.

Recent work has concentrated on improving the methodology of causal mapping, prompting Ramaprasad and Stubbart (1987) to observe that "cognitive map technology is too far ahead of cognitive map theory" (p. 20). That may be the case, but advances in theory will surely follow once the technology

is established. The theory of cause maps led researchers to imagine ways to empirically demonstrate their existence; facility in creating and interpreting cause map data should enrich our theoretical understandings of cognition in organizations in general and of individual and collective cause maps in particular.

Advances in cause map methodology have been of two sorts: (1) techniques for creating collective cause maps, and (2) strategies for analyzing cause map data. In their recent review Weick and Bougon (1986) describe composite cause maps (Eden, Jones, & Sims, 1979 and 1983), average maps (Ford & Hegarty, 1984; Komocar, 1985), and assemblage maps (Hall, 1984). In each of these techniques collective cause maps are created by identifying concepts with common relevance and developing cause-effect relationships among those concepts that reflect either algebraic averages (average maps) or composites of individual perceptions (assemblage and composite maps). Bougon and Komocar (1987) argue that a composite cause map of a social situation is simply the total collection of all individual cognitive maps of that situation.

> Composite maps, whether matrix or diagrammatic form, are constructed by overlaying individual maps on one another in a manner that aligns the nodes, links, and loops common across the maps. (Bougon & Komocar, 1987, p. 24)

The two analysts propose using causal mapping as a basis for organizational change by focusing on loops. Strategic theorists (e.g., Billings & Suarez, 1987) have concentrated on individual cause maps. In preserving individual respondents' unique concepts, it becomes impossible or nonsensical to try to create a collective cause map (Billings & Suarez, 1987, p. 7), because the concepts differ across the subjects. The response

has been to develop content-free indices of the causal structure among concepts and general indices of the concepts evoked. Of particular interest here are the former. Following the lead of Bougon, Weick, and Binkhorst (1977) analysts have unfolded cause map data using indegrees and outdegrees to characterize the causal position of each variable. Ramaprasad and Stubbart (1987) remind us that although pictorial representations have immediate face validity, matrix representations have more interpretive utility--for example they are amenable to computer-assisted analysis.

In the following sections we discuss the methods used in creating individual cause maps for the teachers and principal in an elementary school, the procedures used in analyzing those data, and the results. Methodologically this study demonstrates the complexity of individual cause maps that are broadly focused on the organization rather than on a specific issue. The utility of using indegrees and outdegrees to locate concepts in the causal flow is shown as well as a procedure for distinguishing hierarchical chains of causality from reciprocal loops embedded within individual cause maps. Individual perceptions of influence and the importance attributed to concepts complete the tools for portraying individual cognitive maps of their work organization.

## Orientation to the Data

### Data Collection

The organization studied was Midwestern elementary school consisting of one principal, seventeen regular classroom teachers in grades kindergarten through five, two teachers who taught emotionally and mentally handicapped classes, and seven specialists who worked with small groups of children pulled from their regular classes (speech, reading, psychologist, social worker, learning disabilities, physical education, and music). With the

exceptions of two regular teachers and one special teacher, everyone in this population was included in the study.

The data were collected using an adaptation of Bougon's (1983) Self-Q technique. The concepts were generated by asking respondents to ask themselves questions about themselves in relation to their school, doing a good job, and themselves in relation to others in their school. This technique is enticing because it is simultaneously disarming, thoughtless, and productive.

> In Self-Q interviews, participants essentially interview themselves. The key idea is that they formulate their questions on the basis of their personal knowledge (a status structure) and thinking (a dynamic process) of the situation they are questioning. Thus, the events, objects, and concepts they use to express their questions reveal their tacit and explicit knowledge and understanding of that social situation... This knowledge and understanding is their personal cognitive construction of "the" world; it contains the nodes they use to define that social situation. (Bougon & Komocar, 1987, p. 20)

In the three-step process individuals first ask themselves questions. In the second phase key concepts drawn from the questions are verified and ranked. In this study the respondents were also asked to indicate, for each concept, the level of influence they perceived they had over that concept. Finally, in the third phase, respondents indicated the causal relationships among the most important concepts and the nature of those relationships, if any (direct or inverse).

## Data Analysis

Creating the individual cause maps involved a process in which the analysis moved from a broad, holistic assessment of the cause map to the

delineation of subparts. Although the overall patterns of causality are interesting in their own right, we contend that it is only from the content of concepts, however idiosyncratic or obscure, that meaning of cause maps emerge. Hence, at each stage of the analysis the causal findings were interpreted against the substantive content of the concepts evoked by the individual respondent. To give the reader a feel for these data examples will be drawn from the four first grade teachers at the Horace Mann school. The data are aggregated in Appendices A and B in the form of four individual case studies.

--Insert Table 1 about here--

1. Importance and influence: Cognitive content. The concepts in an individual's cause map, or nodes, represent the foci for sensemaking. These are the chunks of bracketed information the individual has selected (see Weick's enactment-selection-retention sequence, 1979, pp. 130-145) to attend to. In this study the respondents were asked to identify the twenty most important concepts, in order, out of the total set generated. Table 1 displays the top ten variables for each of the four first grade teachers. The first thing that strikes one about this display is the diversity. As noted by Billings and Suarez (1987) in their study of eleven CEOs, when the respondents' own concepts and labels are used, the diversity appears to prohibit any notion of collective sensemaking. These four teachers use highly individualistic cognitive content structures in thinking about their school and their work. However, the disparate concepts can readily be grouped into meaningful categories such as those displayed in Table 2. Despite idiosyncratic "coding," it is possible to distinguish between variables relating to interpersonal or collegial relationships and those relating to classroom instruction. The intent is to create a sustainable

grouping based on the surface similarities among variables in order to describe gross tendencies and to facilitate comparisons. For example, based on the groupings in Table 2, the four first grade teachers display a predictable attention to teaching and instruction. There is also a generalized focus on relationships, especially for Teacher 1, Mrs. Jones. Yet within these general rules, look at what the individual's unique labels for the concepts tell us. Mrs. Jones focuses, not on teaching, but on formal job tasks such as "teaching reading" and "teaching math." She elaborates her focus with a number of concepts relating to goals and expectations: "my own goals," "the goals of Horace Mann," "expectations for children." How different is Mrs. Newsome, who explicitly attends to teaching. To her teaching encompasses many diverse concepts such as: "team teaching philosophy," "creating a non-threatening classroom environment," "using multiple teaching methods," "size of budgets allocated to teachers." Then there is Mrs. Michaels who displays a very detailed attention to the subactivities of teaching: "student time on task," "my instructional pacing," "allocating enough time for academics," "knowing each student's performance level." And finally, Mrs. Allen shows us yet another orientation toward instruction: "providing a positive learning environment," "individualizing instruction," "using instructional materials correctly." One teacher thinks of relationships in terms of "teacher" relationships, another in terms of "staff" relationships, and another in terms of "collegial" relationships. These nuances and individual configurations specify the general orientations to instruction and relationships; one needs both levels of analysis in order to think usefully about the first grade teachers at Horace Mann.

--Insert Table 2 about here--

In addition to content labels, the respondents were asked to rate each variable on their perceived level of influence or control over that variable. There was a surprising lack of variation in these ratings. Overall for the Horace Mann school (n = 24), nearly half the respondents had mean influence ratings (on a scale of 1-5) over 4.0. Only two individuals had means under 3.5, a score which reflects a moderately high level of influence. When the ten most important variables are examined, 15 individuals rated at least 8 variables as either a 4 or 5. That is a high to very high level of influence. Bougon, Weick, and Binkhorst (1977) asked respondents in their study of the UJO to indicate, for every variable, perceived influence as a dichotomous variable, that is, "yes, I think I can influence that variable" or "no, I don't think I can." They found that variables with high participant influence scores (that is, that many participants indicated they had influence over) also tended to be variables that were influenced by many other variables (high number of indegrees). Bougon, Weick, and Binkhorst interpreted this as demonstrating a bias toward caused (rather than causing) variables on the part of individuals in their sensemaking.

> Put another way, participants may pay attention to variables that are heavily controlled by other variables on the assumption they too can control these variables since they too are causal agents. (Bougon, Weick, & Binkhorst, 1977, p. 615)

Komocar (1985), in his study of a university mail system, found a similar relationship between participants' perceived influence and the causal relationships among variables.

These findings were not replicated in this study, due to the strikingly high and consistent ratings by respondents on their perceived level of influence over the content of their cause maps. This difference could be an

artifact of the data collection procedures and the focus in this study on creating individual cause maps with each individual's unique concepts. It may also reflect the relatively autonomous, self-reflective nature of teachers' work. Clearly and consistently the cause maps of the teachers at the Horace Mann school reflected important concepts over which teachers routinely had a high level of influence; the process of creating the cause map was often an empowering experience for teachers who become aware of their level of influence over important aspects of their work world.

--Insert Table 3 about here--

Some interesting variations in influence attributions emerge when influence ratings are compared with importance. In Table 3 we see that despite generally high influence ratings, the four first grade teachers vary in terms of perceived influence. Mrs. Jones appears to feel more in control of her work world than Mrs. Allen. Similar categories, such as relationships, are viewed differently in terms of individual influence. Mrs. Jones rated personal relationships as an area in which she had a very high level of influence, whereas Mrs. Newsome and Mrs. Allen felt they had only a moderately high level of influence over relationships.

2. Causality: Indegrees, outdegrees, loops, and chains. Each variable in an individual cause map is associated with a number of indegrees (causal paths flowing into the variable, which indicate the number of variables which influence a given variable) and a number of outdegrees (causal paths flowing out of the variable which indicate the number of variables a given variable influences). In constructing an etiograph (a la Bougon, Weick, and Binkhorst, 1977--a pictorial representation of causes), the variables are ordered such that causality flows from left to right. Causality begins at the left with variables labeled outpoles, in which

causality flows only outward. Such variables influence other variables but are not influenced by them. The causal flow depicted in an etiograph ends with variables labeled inpoles, in which causality flows only inward. These variables are influenced by other variables but do not pass influence on. The etiograph, as defined by Bougon, Weick, and Binkhorst (1977), becomes a strategy for ordering cause map variables. It is a map in which indegrees and outdegrees function as coordinates to locate a variable in two dimensional "causal" space, relative to the other variables in a cause map (see Figures B-3 and B-4, Appendix B).

Thus, for every variable in each individual's cause map, the number of indegrees and outdegrees can be calculated. This is easily accomplished by converting the raw cause map data into a matrix (see Figure B-2, Appendix B). By summing the columns one arrives at the total indegrees for each variable, summing the rows yields outdegrees. No variable can be located in the causal flow without reference to both coordinates. A variable with high indegrees could be associated with either high or low outdegrees, a condition which is not insignificant.

One notices immediately that some cause maps are more densely linked than others; that it, there are more causal paths between variables. Ramaprasad and Stubbart (1987) found matrix representations of cause maps inefficient due to the large number of empty cells. "Our experience suggests that the total number of strategic relationships among basic elements a strategist will cover [represent] only 15-25% of the cells of the matrix" (1987, p. 11). Cause maps from participants at the Horace Mann school were, on average, significantly more dense. Eleven of 23 respondents had cause maps in which over 50% of the possible relationships among variables existed. The range for the Horace Mann school was from 16% to

98%. The four first grade teachers represented the mean well with densities of 45%, 46%, 55%, and 55%. For these individuals, and their peers, their work organization is viewed as a complex web of causal relations.

Weick (1979) states that the most important variables in a person's cause map will be those with the most activity, or those with the most causal paths associated with them. If so, one would expect to find a significant positive correlation between importance rankings and total causal degrees (see for example Komocar, 1985, pp. 134-139). For the four first grade teachers in the study, we found this to be the case--.59 ($<.01$), .70 ($<.01$), .55 ($<.01$), and .47 ($<.05$). Thus, at least for these teachers, the most important variables are the ones with the most causal paths associated with them.

## Summary and Conclusion

In this paper we closely examined some preliminary results of a current project on individual sensemaking in elementary schools. In our analysis and discussion of the teachers' cause map data, four main points of interest emerged.

First, the very nature of the concepts or variables used by the teachers pose an interesting dilemma for researchers. Despite sharing similar experiences within the school, the teachers' top twenty concepts in the cause maps were so diverse that little direct comparison was allowed. This finding supports contentions that in making sense of ambiguous social events, people will construct very individualistic interpretations of situations.

We resolved this dilemma by creating categories derived from an initial examination of the data. After establishing a category scheme, the concepts were coded and sorted into clusters under each category that could be

compared across individuals. This allowed us to quantify the concept data in several ways, such as looking at the number of concepts that fall under the various categories. One teacher's concept content could then be compared to others'. It also became possible to make comparisons across groups of teachers. Also, as the case study data suggests, the level of abstractness of the concepts could be rated.

A second important finding of this study, related to the nature of the teachers' concepts, is their perceived high level of influence or control over those concepts. When limited to the twenty most important variables, the influence ratings were restricted to the high end of the scale. Whether this level of perceived influence holds true for most teachers in most schools, or even for most professionals, remains an empirical question. However, our analyses suggest that the use of categories for contrasting influence ratings across individuals may help uncover any systematic variability.

A third finding worth highlighting is the utility of examining the causal structure of individual maps. Although no differences in density of causal relations were discovered across the four first grade teachers' cognitive maps, the detailed analysis of each map allowed other structural differences to surface. The existence of reciprocal, hierarchial, and inverse relationships varied widely across the four individuals. By indexing the number, strength, and type of direct (inpole/outpole) effects, as well as the loops embedded within these relationships, the causal flow of the teachers' connected concepts can be examined empirically.

A fourth and final conclusion evident in our findings is that there may be systematic structural differences across individuals on some critical dimensions not fully examined in our data to date. For instance, it has

been repeatedly suggested that significant differences may exist in the cause maps of experts and novices (Billings & Suarez, 1987; Weick & Bougon, 1986). Information presented in the case studies in Appendix A suggests that further analysis along this dimension would be useful.

Table 1
Top Ten Most Important Variables:
First Grade Teachers at Horace Mann

| Importance Ranking | Teacher 1: Mrs. Jones | Teacher 2: Mrs. Newsome | Teacher 3: Mrs. Michaels | Teacher 4: Mrs. Allen |
|---|---|---|---|---|
| 1 | Teaching at Horace Mann | Working closely with other teachers | Getting students to where they are capable of performing by the end of the year | Providing the best possible education for every one of my students |
| 2 | Direct instruction | Seeking advice from my colleagues | Improving my instructional skills | Improving the quality of education I provide |
| 3 | Expectations for children | Openness and sharing among all teachers | Setting high expectations for my class | Providing a positive learning environment |
| 4 | Getting the children to listen | Team teaching philosophy | Knowing what each student is capable of doing | Providing enormous amounts of positive reinforcement |
| 5 | Getting the children to behave | Effective behavior management | Knowing each student's performance level | Using instructional materials correctly |
| 6 | Teaching reading | Student understanding of expectations | Student time on task | Ignoring misbehavior |
| 7 | Teaching math | A non-threatening classroom atmosphere | My instructional pacing | My interaction with "average" students |
| 8 | My own goals | Using discipline to enforce rules | Allocating enough time for academics | Benefiting from the expertise of my peers |
| 9 | The goals of Horace Mann | Being energetic and motivated | Monitoring students' independent work | Insuring each student's best performance |
| 10 | Working with the principal | Making learning fun | Setting reasonable goals for each student | Providing plenty of correspondence with parents |

Table 2
Content Categories:
First Grade Teachers at Horace Mann

| Category Size (in number of concepts) | Teacher 1: | Teacher 2: | Teacher 3: | Teacher 4: |
|---|---|---|---|---|
| 1. Largest category | Relationships (n = 8) | Teaching (n = 9) | Classroom: instructional (n = 9) | Instruction (n = 6) |
| 2. | Goals and expectations (n = 6) | Relationships (n = 4) | Classroom: non instructional (n = 5) | Resources (n = 5) |
| 3. | Formal job tasks (n = 4) | Classroom management (n = 2) | Relationships (n = 4) | Relationships (n = 4) |
| 4. Smallest category | Classroom management (n = 2) | Personal characteristics (n = 2) | Parents (n = 2) | My personal best (n = 3) |

Table 3
Influence and Importance by Content Categories: First Grade Teachers at Horace Mann

| Variable Category | Importance (mean rank) | Influence (mean rating on scale of 1-5) |
|---|---|---|
| Teacher 1: Mrs. Jones | | |
| Personal and professional relationships | 14.2 | 4.8 |
| Goals and expectations | 11.9 | 4.3 |
| Formal job tasks | 5.0 | 5.0 |
| Classroom and behavior management | 4.5 | 5.0 |
| Teacher 2: Mrs. Newsome | | |
| Teaching | 10.8 | 3.6 |
| Teacher relationships | 5.8 | 3.5 |
| Classroom management | 6.5 | 4.5 |
| Personal characteristics | 10.0 | 5.0 |
| Teacher 3: Mrs. Michaels | | |
| Classroom: instructional | 5.5 | 4.1 |
| Classroom: non-instructional | 10.8 | 4.7 |
| Staff relationships | 15.5 | 3.5 |
| Parents | 19.5 | 4.5 |
| Teacher 4: Mrs. Allen | | |
| Instruction | 6.8 | 3.8 |
| Resources | 15.2 | 2.6 |
| Interpersonal relationships | 10.5 | 4.5 |
| Delivering my personal best | 4.0 | 4.0 |

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## Appendix A

## Case Studies of the First Grade Teachers

### Teacher 1: Mrs. Jones

Mrs. Jones (all names used in these case studies are fictitious) has taught at the Horace Mann school for 25 years. She experienced the school's "bad times" and participated in its dramatic turn around and current success.

When asked to identify the most important elements in her work environment, she listed variables dealing with interpersonal and professional relationships most often. However, variables dealing with assigned job tasks and classroom management were identified as most important. (Table A-1 lists the variable categories by frequency and relative importance.) Although items related to relationships were mentioned most frequently, they were ranked lowest in importance. In contrast, items related to classroom management and formal job characteristics were mentioned least frequently but were ranked higher in importance. The top five variables identified by Mrs. Jones were:

1. Teaching at Horace Mann
2. Direct instruction
3. Expectations for children
4. Getting the children to listen
5. Getting the children to behave

Mrs. Jones feels she has very high levels of influence over the variables in her cause map (see Table B-8). Seventeen of the twenty most important variables received a rating of "5" (5 = very high level of perceived influence). Three variables received a rating of "3" (3 = modest level of perceived influence). We may conclude, then, that Mrs. Jones' attention to the formal characteristics of her job and to classroom management is an

empowered view; that is, she feels she can control or manipulate those things that are most important to her.

--Insert Table A-1 about here--

In examining the various roles emphasized in the content variables of Mrs. Jones' cause map, 5 of the 20 variables did not reference any specific role. The remaining variables were distributed among emphases on students, self, other teachers, and to a lesser degree, the principal (see Table B-6). Mrs. Jones is making sense of her work life in terms of the immediate organizational environment and task demands. She has ordered her cause map around the here and now.

The causal relations among these variables are characterized by a mid-level of reciprocity (61% of the relationships among variables are reciprocal), a low level of density (10% of the variables fall into the upper quartile in terms of number of causal relationships with other variables), and a low level of inverse relationships (only 8% of the total number of relationships flow from right to left in the cause map--see Figure B-5). The most important variable, v1, teaching at Horace Mann, was also the variable with the most causal activity. The total number of degrees associated with this variable was 32--17 indegrees and 15 outdegrees. The variable with the fewest ties to other variables was v13, doing extra things developed for the staff by the principal. It was associated with 6 indegrees and 4 outdegrees for a total of 10 relationships (see Table B-8).

The cause map contains both reciprocal (mutually-caused) relationships and hierarchical (lineally-caused) relationships (see Figure B-3). Reciprocal relationships center around (1) school variables (v1 and 9, teaching at Horace Mann and the goals of Horace Mann), (2) subject variables (v6 and 7, teaching reading and teaching math), and (3)

behavior management (v4, getting the children to listen). The school variables are reciprocally linked to most of the other variables in Mrs. Jones' cause map. They are not linked to variables relating to expectations for teachers and children. There is one clear cluster of mutually linked variables in Mrs. Jones cause map centered around v1, teaching at Horace Mann. This cluster or "loop" links variables 11, 15, 16, 17,and 18--all dealing with getting along well as a faculty at Horace Mann. The variables are integral to Mrs. Jones' cause map. They influence and are influenced by many others in her work world (see Figure B-3).

If the reciprocal relationships are removed, one is able to examine an individual's hierarchical cause map, the map which contains the unique, one- way relationships. One should always keep in mind that these data represent the minority of relationships in most cause maps. That is, reciprocity among variables is the norm rather than the exception in organizational sensemaking. Mrs. Jones' hierarchical cause map (displayed in Figures B-4 and B-5) reveals a flow of causality from three key outpoles (variables which predominately influence other variables and are not themselves influenced): v8, my own goals; v11, working well with the staff; and v10, working with the principal. Causality flows to three inpoles (variables which are influenced or controlled by other variables): v2, direct instruction; v3, expectations for children; and v4, getting the children to listen. Between these poles are two key nodes, which channel much of the causal flow. One node is v12, expectations for teachers, with 4 hierarchical indegrees and 5 hierarchical outdegrees. The other is v19, communicating to teachers what is expected of them, with 4 indegrees and 7 outdegrees. Mrs. Jones perceives that v19 influences v12, that communicating to teachers what is expected of them influences expectations for teachers, in the sense of

teachers' understanding of what the expectations are. The causal flow channelled through these two nodes directs the top eight variables ranked in terms of importance. This flow may be portrayed as follows:

Working well with the principal and staff → Teachers' understanding expectations → Teaching performance

Describing Mrs. Jones' sensemaking requires attention to (1) the content of the variables, (2) the reciprocal relationships among clusters of variables, and (3) linear flows of causality. In summary, Mrs. Jones' cause map of her work life at Horace Mann can be typified as follows:

- the constraints of her job and school context
- an awareness of her influence over those constraints
- a view of performance as informed by superordinate expectations
- a need to know what is expected of her
- a belief that congeniality and cooperation should characterize her work environment.

Teacher 2: Mrs. Newsome

Mrs. Newsome is in her first year of teaching at the Horace Mann school. She is trying hard to fit in, to learn the ropes and to become an accepted and integrated member of the school community. The most frequently-mentioned variables in her cause map deal with teaching (see Table A-2). She is primarily concerned with the parameters set for her teaching by the Horace Mann school (its team teaching philosophy, the structure of self-contained classrooms, the size of the budget allocated to teachers, meeting district curriculum objectives, and her personal hopes for her teaching--creating a non-threatening classroom atmosphere, making

learning fun, using multiple teaching styles, accommodating multiple learning styles). Less frequently mentioned areas include classroom management (e.g., effective behavior management) and personal goals (e.g., being enthusiastic and motivated). Mrs. Newsome rates a cluster of four variables dealing with teacher relationships near the top in terms of importance. Teaching is the largest area of concern (frequency) but teacher relationships are rated most important, not surprising for a first year teacher. In order to fit in she must succeed in both teaching and teacher relationships.

--Insert Table A-2 about here--

Mrs. Newsome perceives a much lower level of personal influence over these variables than the more experienced Mrs. Jones. For the top 17 variables in her cause map, the mean level of perceived influence was 3.8--a moderately high level. For her top five variables in terms of importance, the mean level of influence was only 3.0. Her area of greatest control centers on her classroom performance.

The causal relations among these variables are characterized by a moderate number of reciprocal relationships (76%), a high density in the number of relationships across variables (41% of the variables fall into the upper quartile of summed indegrees and outdegrees), and a low number of inverse relationships (7%). Although the average number of reciprocal relationships is moderate, there is a wide range. Variable 2, seeking advice from my colleagues, is a totally reciprocal variable; that is, every variable influenced by v2, influences it in return. Variable 2 is causally linked to 11 of the top 16 variables in Mrs. Newsome's cause map. It is integral to the way she makes sense of her work life at Horace Mann. At the other end of the continuum, v16, size of budgets allocated to teachers,

is related only uni-directionally. No other variable influences this variable; it influences only 3 other variables--v9, being energetic and motivated; v10, making learning fun for students; and v11, being well-organized.

Two sets of "looped" variables are critical in understanding Mrs. Newsome's sensemaking. Variables 5, 6, 7,and 8 are all mutually linked in a deviation amplifying loop. Substantively, this loop relates effective behavior management (v5), student understanding of expectations (v6), using discipline to enforce rules (v8), and creating a non-threatening classroom atmosphere (v7). Classroom management and communicating expectations to students appear to be key ingredients in creating a desirable classroom atmosphere. More importantly, these concepts are linked in a mutually reinforcing causal chain. A second deviation amplifying loop can be found in variables 10, 11, 13, and 14. This loop links making learning fun (v10), being well-organized (v11), accommodating multiple learning styles (v13), and using multiple teaching methods (v14).

Each of these loops sets a desirable outcome--making learning fun (v10) and creating a non-threatening classroom environment (v7)--into a network of mutually causal influences. Mrs. Newsome perceives her classroom atmosphere to be a result of behavior management activities and students' understanding of expectations. Similarly, learning will be fun to the extent that: (1) multiple learning styles are accommodated, (2) she is well-organized, and 3) she uses multiple teaching methods.

Hierarchical causal relationships in Mrs. Newsome's cause map are organized around three key sources of influence: v12, organizing lesson plans according to district curriculum objectives; v17, staff socializing; and v16, size of budgets allocated to teachers. This influence is dissipated

somewhat over the remaining variables: v6, student understanding of expectations; v11, being well-organized; and v7, creating a non-threatening classroom environment, are solely controlled by other variables and pass on no unique influence. In general, one might portray this hierarchical cause map as showing causality flow from factors outside the classroom to those internal to the teachers and students. An example of a hierarchical causal chain* is the pathway from v16, size of budgets allocated to teachers, to v9, being energetic and motivated, to v13, accommodating multiple learning styles, and on to v6, v7, and v1, students understanding of expectations, a non-threatening classroom environment, and working closely with other teachers. Most of the causal flow begins with v12, organizing lesson plans to meet district curricular objectives, is distributed across a group of variables describing teaching and the personal attributes Mrs. Newsome brings to it, to controlled variables, v1, 6, 7, and 11.

What is striking about Mrs. Newsome's sensemaking is the complexity of relationships that knit together her multifaceted and challenging world. Her cause map consists of three increasingly linear, and straightforward levels. She views her world through social lenses, seeing the social and collegial relationships with her peers as instrumental and inseparable from all aspects of her work life at Horace Mann. She thinks of her teaching primarily in terms of two related and mutually reinforcing variables. Finally, she sees the constraints of school and district policy as having a linear impact on how she feels about her teaching and her ability to perform.

*Note that hierarchical relationships are linear not circular. However, in some instances the hierarchical chain folds back onto itself. The reciprocal loops discussed above are more complicated than simple loops--every variable influences and is influenced by every other variable.

Teacher 3: Mrs. Michaels

Mrs. Michaels has taught at the Horace Mann school for 13 years, and at the encouragement of the principal, Mrs. Odden, is working on her administrative certificate. Mrs. Odden would like Mrs. Michaels to succeed her as principal when she retires.

The variables Mrs. Michaels noted as of most importance to her in her role at the Horace Mann school were predominately classroom related (14 out of 20). This set could be further specified as those relating to instructional concerns (e.g., v2, improving my instructional skills; v5, knowing each students' performance level; v7, my instructional pacing; and v10, setting reasonable goals for each student), and those related to non-instructional classroom concerns (e.g., v3, setting high expectations for my class; v8, allocating enough time for academics; and v15, being effective in classroom management). Variables relating to faculty and staff relationships (e.g., v11, coordinating my activities with support staff, and v18, my caring for other staff members' feelings) and variables relating to parents (e.g., v20, frequency of my communication with parents) were not only mentioned less often, but were rated substantially lower.

--Insert Table A-3 about here--

In general, Mrs. Michaels perceives that she has a high level of influence over the important variables in her work life. The top 20 variables in importance received a mean rating of 4.4. Her level of perceived influence varies noticeably by category. For instance, she apparently feels that she is well in control of her classroom, but slightly more in control of the non-instructional than the instructional aspects of it. She feels least in control of personal and professional relationships with staff members in the school, but even in this area the rating is 3.5.

The causal relationships among these variables are characterized by a moderate amount of reciprocity (71% of the relationships are reciprocal), a high degree of density (50% of the variables fall into the upper quartile in terms of number of causal relationships with other variables), and by a total absence of inverse relationships. Variable 1, getting students to where they are capable of performing by the end of the year, is influenced by every other variable except v18, my caring for other staff members' feelings. As v1 passes no influence along, it is a true inpole--a variable totally controlled by others.

There are two significant clusters of reciprocally-linked variables in Mrs. Michaels' cause map. The first involves variables 2, 3, 4, 5, 6, and 13: improving my instructional skills (v2), setting high expectations for my class (v3), knowing what each student is capable of doing (v4), knowing each student's performance level (v5), student time on task (v6), and treating students fairly (v13). What is interesting about this cluster is the way v2 is conceived: improving my instructional skills not only influences the other instructional variables (such as, v3, setting high expectations for my class), but is also influenced by them. In other words, to Mrs. Michaels, improving her instructional skills was not viewed as acquiring new competencies, but merely as using and improving those she already possessed. The second cluster involves only three variables: v11, coordinating my activities with support staff; v17, relating well with other staff members; and v18, my caring for other staff members' feelings. Coordinating requires relating well, which requires care, and vice versa. Variable 11 plays a linking pin function here, since it is also influenced by the cluster of variables 2, 3, 4, 5, 6, and 13. Variable 11 links the two reciprocal clusters and shows a causal flow between the technical issues of instruction and interpersonal relationships.

Even with the reciprocal relationships factored out, Mrs. Michaels' cause map is extremely dense. Clear linear, one-way flows of causality move from the outpoles (v16, sharing my ideas with other staff members; v20, frequency of my communication with parents; and v11, coordinating my activities with support staff) to the single inpole, v1 (getting students to where they are capable of performing by the end of the year). Not only does v20 directly influence v1, it indirectly influences v1 through v4 (knowing what each student is capable of doing) and from v4 to v8 (allocating enough time for academics). Variables 7, 10, and 12 are major nodes in this causal flow suggesting their importance in their own right (v7, my instructional pacing; v10, setting reasonable goals for each student; and v12, treating students fairly). Variables 17 and 18 are not hierarchically related to any other variables. The ordered causal flow in Mrs. Michaels' cause map may be summarized as follows:

sharing and coordinating ⟶ instructional behaviors ⟶ maximal student achievement

Mrs. Michaels is strongly focused on the techniques of teaching and perceives a world in which she will strengthen her craft through collegial interactions. Improved teaching will, in turn, influence the extent to which she is able to achieve what appears to be a personally-held professional goal, getting students to where they are capable of performing by the end of the year.

Teacher 4: Mrs. Allen

Like Mrs. Newsome, Mrs. Allen is a new teacher at the Horace Mann school. Her assignment is split. In the mornings she teachers a section of the "structured" kindergarten; in the afternoons she teaches a split kindergarten and first grade section. Like most other first grade teachers, she

interacts frequently with other primary grade teachers. She also has personal friendships with the two EMH teachers and one fourth grade teacher.

--Insert Table A-4 about here--

Although the content of Mrs. Allen's cause map is distributed somewhat evenly across the four categories, the preponderance of variables relate to instruction (see Table A-4). This cluster of six variables includes concepts such as providing enormous amounts of positive reinforcement (v4), using instructional materials correctly (v5), and ignoring misbehavior (v6). The next most frequently-mentioned cluster concerns variables relating to resources, e.g., additional resources within the building (v13), and community resources (v15). Variables focusing on interpersonal relationships treated faculty, parents, and students (e.g., v7, my interactions with average students; v10, providing plenty of correspondence with parents; and v8, benefiting from the expertise of my peers. Her smallest category contained three variables that encompassed the notion of doing one's best (e.g., v1, providing the best possible education for every one of my students).

Mrs. Allen's level of perceived influence over the 18 variables of most importance to her was only modest--3.7. Differences in level of influence were marked among the variable categories. She perceived herself to have little influence over resources and quite a strong influence over personal relationships. The latter may simply be reflective of the way she views these relationships. At least for this cause map, relationships are important in the sense of the frequency with which they occur and the benefits that accrue as a result of interpersonal interactions.

The causal relationships among variables in Mrs. Allen's cause map are characterized by a high level of reciprocity (83% of the relationships are reciprocal), a moderate level of density (only 28% of the variables fall

into the upper quartile in terms of number of links to other variables), and a high number of inverse relationships (22%). One variable (v16, Horace Mann in relation to other schools) had no causal ties to any other variables. Variables 1 and 2 (providing the best possible education for every one of my students, and improving the quality of education I provide), on the other hand, were causally linked to every other variable. Specifically, variables 1 and 2 influenced every other variable (except v16) and were influenced by every other variable (except v16). Variable 9, insuring each student's best performance, is linked reciprocally to every variable except v16, 17 and 18.

The most striking cluster of linked variables is the relationship between v1, 2, 9, 11, 12 and v13, 14, 15. The first group includes the entire "Personal Best" category (v1, 2, 9); v11 and 12 relate to individualizing instruction and exposing children to a wide variety of instructional methods. This cluster is reciprocally linked to the cluster v13, 14, 15--building and community resources. Mrs. Allen feels she will be successful to the extent she can tap into these resources, which in turn will contribute to her success. Interestingly though, she sees an inverse relationship between insuring each student's best performance (v9), individualizing instruction (v11), exposing children to a wide variety of instructional methods (v12), and resource availability. To the extent that she is successful with v9, 11, and 12, she will deplete resources, which in turn will cause her to be less successful on v9, 11, and 12. This is a deviation stabilizing loop, but a negative one.

Mrs. Allen's hierarchical cause map illuminates the linear aspects of her world. Variables 1 and 2 drop off completely since the relationships associated with those two variables are totally reciprocal. What we see in

the hierarchical cause map is (1) the strong negative effect of teaching variables on resources and their availability, and (2) to a lesser extent, the importance of v8, benefiting from the expertise of my peers. Variable 5, using instructional materials correctly, is a strong central node, collecting influence from v4 (positive reinforcements), v8 (expertise of my peers), and v12 (use of correct materials) and channeling these influencers either directly to v17 (amount of interactions with my staff) or v3 (providing a positive learning environment). Mrs. Allen's hierarchical cause map may be summarized as follows:

Variety in instructional techniques → Classroom environment → (-) Resource availability, Amount of staff interactions

Mrs. Allen appears to view her job as a sort of zero sum game in which her personal efforts to succeed with her students reduce the likelihood of further success and her need to interact with her colleagues.

Table A-1

Content Variables in Mrs. Jones' Cause Map

| Variable Category | Frequency (# of variables) | Importance (mean rank) |
|---|---|---|
| Interpersonal and professional relationships | 8 | 14.25 |
| Goals and expectations | 6 | 11.83 |
| Formal characteristics of the job | 5 | 5.0 |
| Classroom and behavior management | 2 | 4.5 |

Table A-2
Content Variables in Mrs. Newsome's Cause Map

| Variable Categories | Frequency (# of variables) | Importance (mean rank) |
|---|---|---|
| Teaching | 8 | 10.5 |
| Teacher relationships | 4 | 5.75 |
| Classroom management | 2 | 6.5 |
| Personal | 2 | 10 |

Table A-3

Content Variables in Mrs. Michaels' Cause Map

| Variable Category | Frequency (# of variables) | Importance (mean rank) | Percent Influence (mean on scale of 1-5) |
|---|---|---|---|
| Classroom-related | | | |
| A. Instruction | 8 | 5.5 | 4.1 |
| B. Non-instructional classroom | 6 | 10.8 | 4.67 |
| Staff relationships | 4 | 15.5 | 3.5 |
| Parents | 2 | 19.5 | 4.5 |

Table A-4

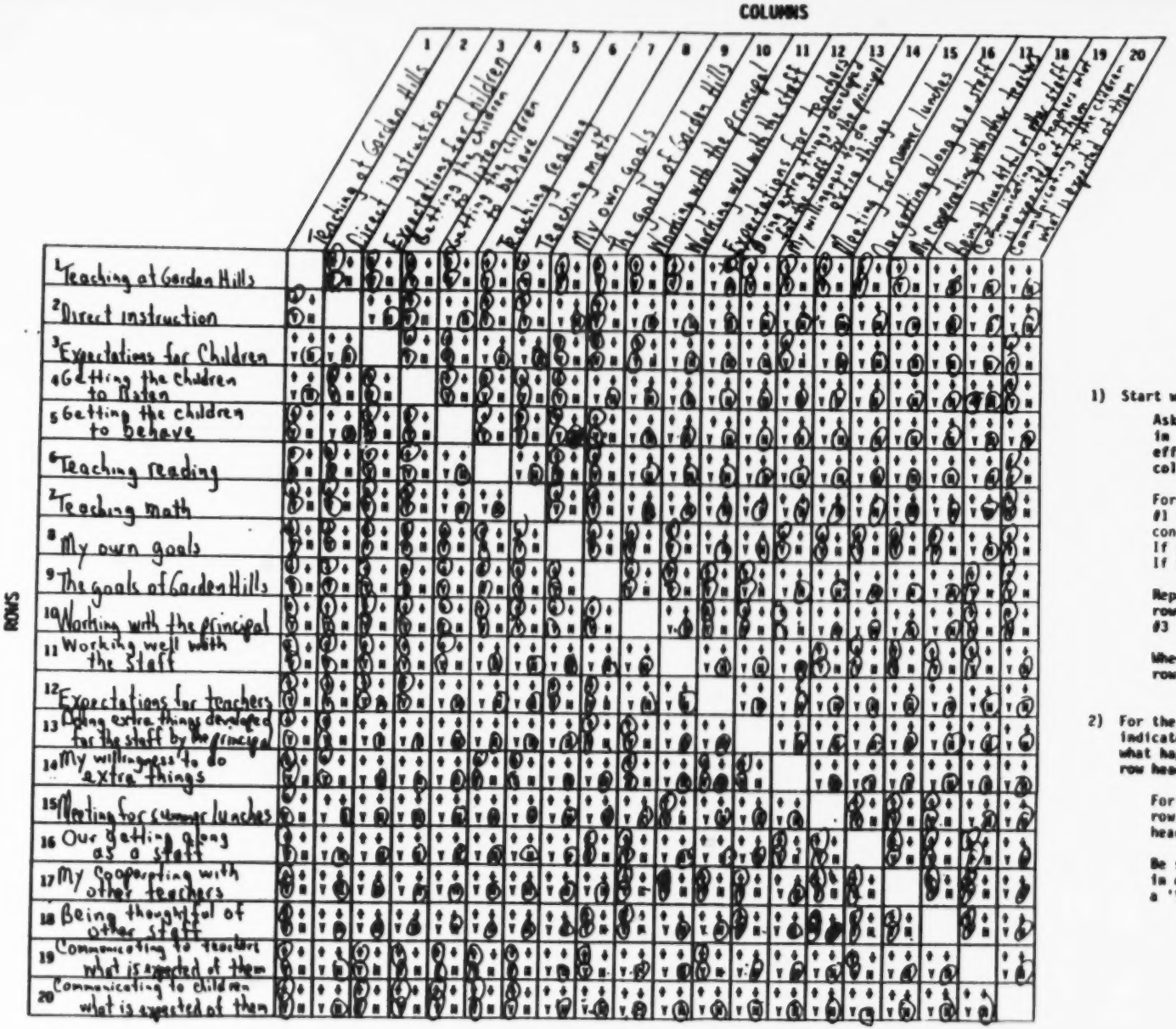
Content Variables in Mrs. Allen's Cause Map

| Variable Category | Frequency (# of variables) | Importance (mean rank) | Perceived Influence (mean on scale of 1-5) |
|---|---|---|---|
| Instruction | 6 | 6.8 | 3.7 |
| Resources | 5 | 15.2 | 2.6 |
| Interpersonal relationships | 4 | 10.5 | 4.5 |
| My personal best | 3 | 4.0 | 4.0 |

## Appendix B

### Complete Cause Map Data Analysis Package for Mrs. Jones


| | |
|---|---|
| Table B-1 | Influence Matrix (raw cause map data) |
| Table B-2 | Coding Matrix |
| Table B-3 | Indegree Ranking |
| Table B-4 | Outdegree Ranking |
| Figure B-1 | Cause Map Unfolded by Indegrees |
| Figure B-2 | Cause Map Unfolded by Outdegrees |
| Figure B-3 | Reciprocal Cause Map: Etiograph |
| Table B-5 | Calculation for Hierarchical Cause Map |
| Figure B-4 | Hierarchical Cause Map: Etiograph |
| Figure B-5 | Hierarchical Cause Map: Signed Digraph |
| Table B-6 | Role Emphasis Sheet |
| Table B-7 | Cause Map Summary Sheet |
| Table B-8 | Statistical Analysis Coding Sheet |


COLUMNS
ROWS
--START HERE--
1 Teaching at Garden Hills
2 Direct instruction
3 Expectations for Children
4 Getting the children to listen
5 Getting the children to behave
6 Teaching reading
7 Teaching math
8 My own goals
9 The goals of Garden Hills
10 Working with the principal
11 Working well with the staff
12 Expectations for teachers
13 Doing extra things developed for the staff by the principal
14 My willingness to do extra things
15 Meeting for summer lunches
16 Our getting along as a staff
17 My cooperating with other teachers
18 Being thoughtful of other staff
19 Communicating to teachers what is expected of them
20 Communicating to children what is expected of them

< DIRECTIONS >

1) Start with the rows, in numerical order.

Ask yourself, do the concepts named in the rows influence or have an effect on the concepts heading the columns at the top?

For example, does the concept in row #1 influence or have an effect on the concept in column #2?
If yes, circle the 'Y' in the box.
If no, circle the 'N'.

Repeat, asking about the influence of row #1 on the concepts named in columns #3 through #20.

When you have completed row #1, move to row #2, and so on through all the rows.

2) For the boxes in which you circle the 'Y', indicate by circling the appropriate arrow what happens when the concept named in the row heading increases.

For example, when the concept heading row #1 increases, does the concept heading column #2 increase or decrease?

Be sure to circle the appropriate arrow in every box in which you have circled a 'Y'.

Table B-1

Influence Matrix



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Table B-2 Coding Matrix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Rec. I | Rec. O | Hier. I | Hier. O | Total R | Total H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 17 | 15 | 4 | 2 | 32 | 6 |
| 2 | 1 | | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 5 | 6 | 0 | 16 | 6 |
| 3 | 0 | 0 | | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 12 | 7 | 6 | 1 | 19 | 7 |
| 4 | 0 | 1 | 1 | | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 13 | 7 | 6 | 0 | 20 | 6 |
| 5 | 1 | 0 | 1 | 1 | | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 7 | 4 | 2 | 16 | 6 |
| 6 | 1 | 1 | 1 | 1 | 0 | | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 7 | 4 | 1 | 17 | 5 |
| 7 | 1 | 1 | 1 | 1 | 0 | 0 | | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 7 | 4 | 1 | 17 | 5 |
| 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 9 | 16 | 1 | 8 | 25 | 9 |
| 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 13 | 14 | 2 | 3 | 27 | 5 |
| 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 9 | 14 | 3 | 8 | 23 | 11 |
| 11 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 5 | 10 | 2 | 7 | 15 | 9 |
| 12 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 6 | 4 | 5 | 11 | 9 |
| 13 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 3 | 1 | 10 | 4 |
| 14 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 7 | 3 | 5 | 12 | 8 |
| 15 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | 1 | 1 | 1 | 0 | 0 | 6 | 5 | 1 | 0 | 11 | 1 |
| 16 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | | 1 | 1 | 1 | 0 | 7 | 8 | 2 | 3 | 15 | 5 |
| 17 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | | 1 | 1 | 0 | 6 | 9 | 1 | 4 | 15 | 5 |
| 18 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | 1 | 0 | 5 | 8 | 2 | 5 | 13 | 7 |
| 19 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | | 0 | 6 | 9 | 4 | 7 | 15 | 11 |
| 20 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 7 | 6 | 3 | 2 | 13 | 5 |
| T | 17 | 11 | 12 | 13 | 9 | 10 | 10 | 9 | 13 | 9 | 5 | 5 | 6 | 5 | 6 | 7 | 6 | 5 | 6 | 7 | 171 | 171 | 65 | 65 | 342 | 130 |

48

Table B-3

Indegree Ranking

| Variable Number | Number of Indegrees | Indegree Ranking |
|---|---|---|
| 1 | 17 | 20.0 |
| 4 | 13 | 18.5 |
| 9 | 13 | 18.5 |
| 3 | 12 | 17.0 |
| 2 | 11 | 16.0 |
| 6 | 10 | 14.5 |
| 7 | 10 | 14.5 |
| 5 | 9 | 12.0 |
| 8 | 9 | 12.0 |
| 10 | 9 | 12.0 |
| 16 | 7 | 9.5 |
| 20 | 7 | 9.5 |
| 13 | 6 | 6.5 |
| 15 | 6 | 6.5 |
| 17 | 6 | 6.5 |
| 19 | 6 | 6.5 |
| 11 | 5 | 2.5 |
| 12 | 5 | 2.5 |
| 14 | 5 | 2.5 |
| 18 | 5 | 2.5 |

Table B-4

Outdegree Ranking

| Variable Number | Number of Outdegrees | Outdegree Ranking |
|---|---|---|
| 8 | 16 | 20.0 |
| 1 | 15 | 19.0 |
| 9 | 14 | 17.5 |
| 10 | 14 | 17.5 |
| 11 | 10 | 16.0 |
| 17 | 9 | 14.5 |
| 19 | 9 | 14.5 |
| 16 | 8 | 12.5 |
| 18 | 8 | 12.5 |
| 3 | 7 | 8.5 |
| 4 | 7 | 8.5 |
| 5 | 7 | 8.5 |
| 6 | 7 | 8.5 |
| 7 | 7 | 8.5 |
| 14 | 7 | 8.5 |
| 12 | 6 | 4.5 |
| 20 | 6 | 4.5 |
| 2 | 5 | 2.5 |
| 15 | 5 | 2.5 |
| 13 | 4 | 1.0 |

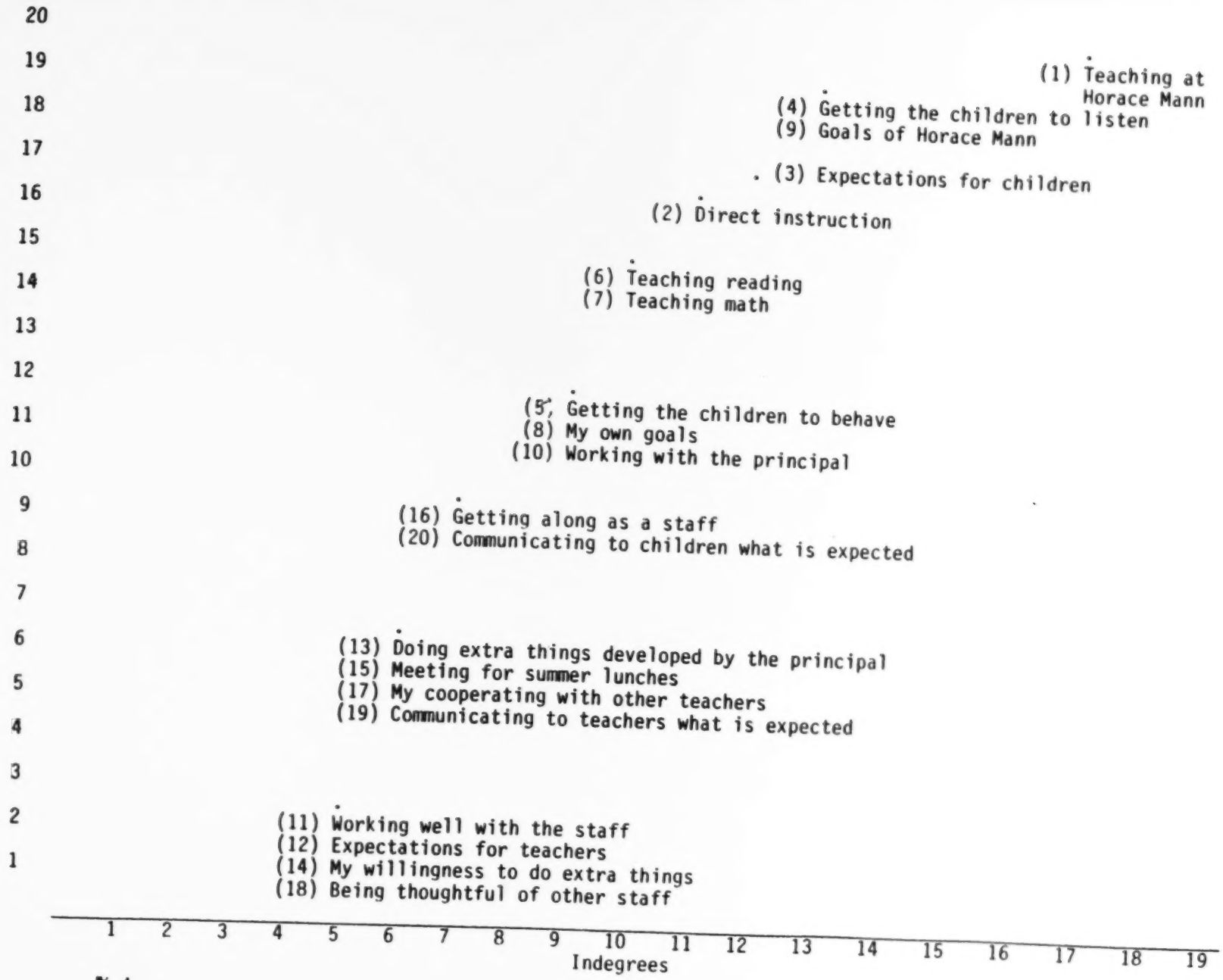




Figure B-1
Cause Map Unfolded by Indegrees

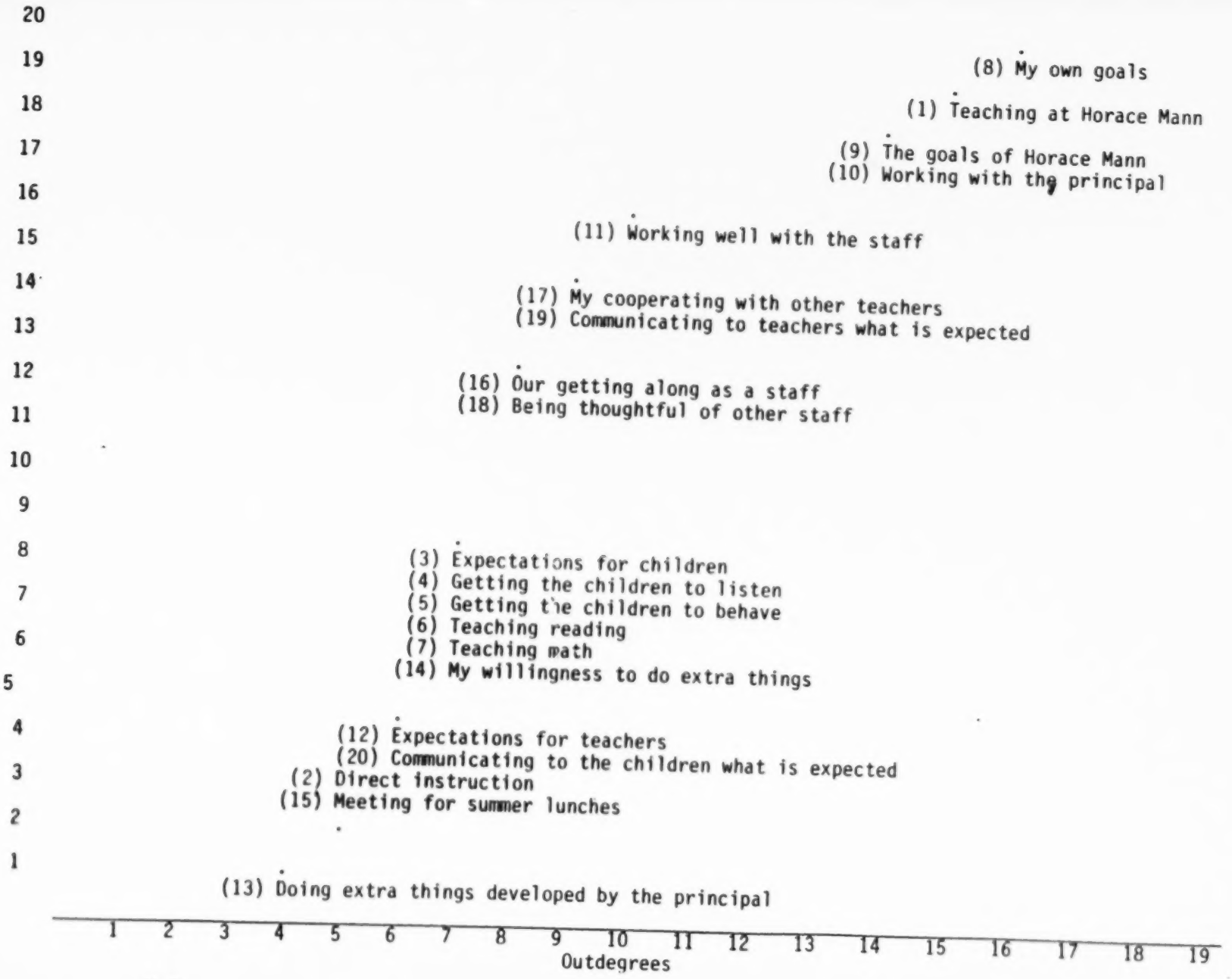




Figure B-2
Cause Map Unfolded by Outdegrees

Working well with the staff
11
(5,10)

My own goals
8
(9,16)

Working with the principal
10
(9,14)

My willingness to do extra things
14
(5,7)

My cooperation with other teachers
17
(6,9)

Being thoughtful of other staff
18
(5,8)

Communicating to teachers what is expected of them
19
(6,9)

Teaching at Horace Mann
1
(17,15)

The goals of Horace Mann
9
(13,14)

Expectations for teachers
12
(5,6)

Meeting for summer lunches
15
(6,5)

Our getting along as a staff
16
(7,8)

Communicating to the children what is expected
20
(7,6)

Getting the children to behave
5
(9,7)

Teaching reading
6
(10,7)

Teaching math
7
(10,7)

Doing extra things developed by the principal
13
(6,4)

Direct instruction
2
(11,5)

Expectations for
3
(12,7)

Getting the children to listen
4
(13,7)

Outpole

Inpole

Figure B-3

Reciprocal Cause Map: Etiograph

Table B-5

Calculation for Hierarchical Cause Map

| Indegrees | Variable Number | Outdegrees |
|---|---|---|
| 2 5 6 7 8 9 10 11 (12) 13 14 15 16 17 (18) (19) (20) | 1 | 2 (3) (4) 5 6 7 8 9 10 11 13 14 15 16 17 |
| 1 4 6 7 (8) 9 (10) (11) (12) (13) (14) | 2 | 1 4 6 7 9 |
| (1) 4 5 (6) (7) 8 9 10 (11) (12) (19) 20 | 3 | 4 5 8 9 10 (14) 20 |
| (1) 2 3 5 6 7 8 (9) (10) (11) (12) (19) 20 | 4 | 2 3 5 6 7 8 20 |
| 1 3 4 8 9 (10) (11) (19) (20) | 5 | 1 3 4 (6) (7) 8 9 |
| 1 2 4 (5) 8 9 (10) (14) (19) 20 | 6 | 1 2 (3) 4 8 9 20 |
| 1 2 4 (5) 8 9 (10) (14) (19) 20 | 7 | 1 2 (3) 4 8 9 20 |
| 1 3 4 5 6 7 9 10 (12) | 8 | 1 (2) 3 4 5 6 7 9 10 (11) (14) (15) (16) (17) (18) (20) |
| 1 2 3 5 6 7 8 (10) 12 13 16 (18) 19 | 9 | 1 2 3 (4) 5 6 7 8 10 (11) 12 13 (19) 20 |
| 1 3 8 9 13 14 (15) (17) (18) | 10 | 1 (2) 3 (4) (5) (6) (7) 8 9 (12) 13 14 (19) (20) |
| 1 (8) (9) 15 17 | 11 | 1 (2) (3) (4) (5) 15 (16) 17 (18) (19) |
| 9 (10) (14) (17) (19) | 12 | (1) (2) (3) (4) (8) 9 |
| 1 9 10 (14) (17) (18) | 13 | 1 (2) 9 10 |
| (1) (3) 8 10 (16) | 14 | 1 (2) (6) (7) 10 (12) (13) |
| 1 (8) 11 16 17 18 | 15 | 1 11 16 17 18 |
| 1 (8) (11) 15 17 18 19 | 16 | 1 (9) (10) (14) 15 17 18 19 |
| 1 (8) 11 15 16 18 | 17 | 1 (10) 11 (12) (13) 15 16 18 (19) |
| (8) (11) 15 16 17 | 18 | (1) (9) (10) (13) 15 16 17 (19) |
| 9 (10) (11) 16 (17) (18) | 19 | (1) (3) (4) (5) (6) (7) 9 (12) 16 |
| 3 4 6 7 (8) (9) (10) | 20 | (1) 3 4 (5) 6 7 |

My own goals
8
(1,8)

Working well with the principal
10
(3,8)

Working well with the staff
11
(2,7)

The goals of Horace Mann
9
(1,3)

My willingness to do extra things
14
(3,5)

My cooperation with other teachers
17
(1,4)

Being thoughtful of other staff
18
(2,5)

Communicating to teachers what is expected
19
(4,7)

Expectations for teachers
12
(4,5)

Our getting along as a staff
16
(2,3)

Communicating to the children what is expected
20
(3,2)

Teaching at Horace Mann
1
(4,2)

Getting the children to behave
5
(4,2)

Teaching reading
6
(4,1)

Teaching math
7
(4,1)

Doing extra things developed by the principal
13
(3,1)

Meeting for summer lunches
15
(1,0)

Direct instruction
2
(6,0)

Expectations for children
3
(6,1)

Getting the children to listen
4
(6,0)

Outpole

Inpole





Figure B-4
Hierarchical Cause Map: Etiograph

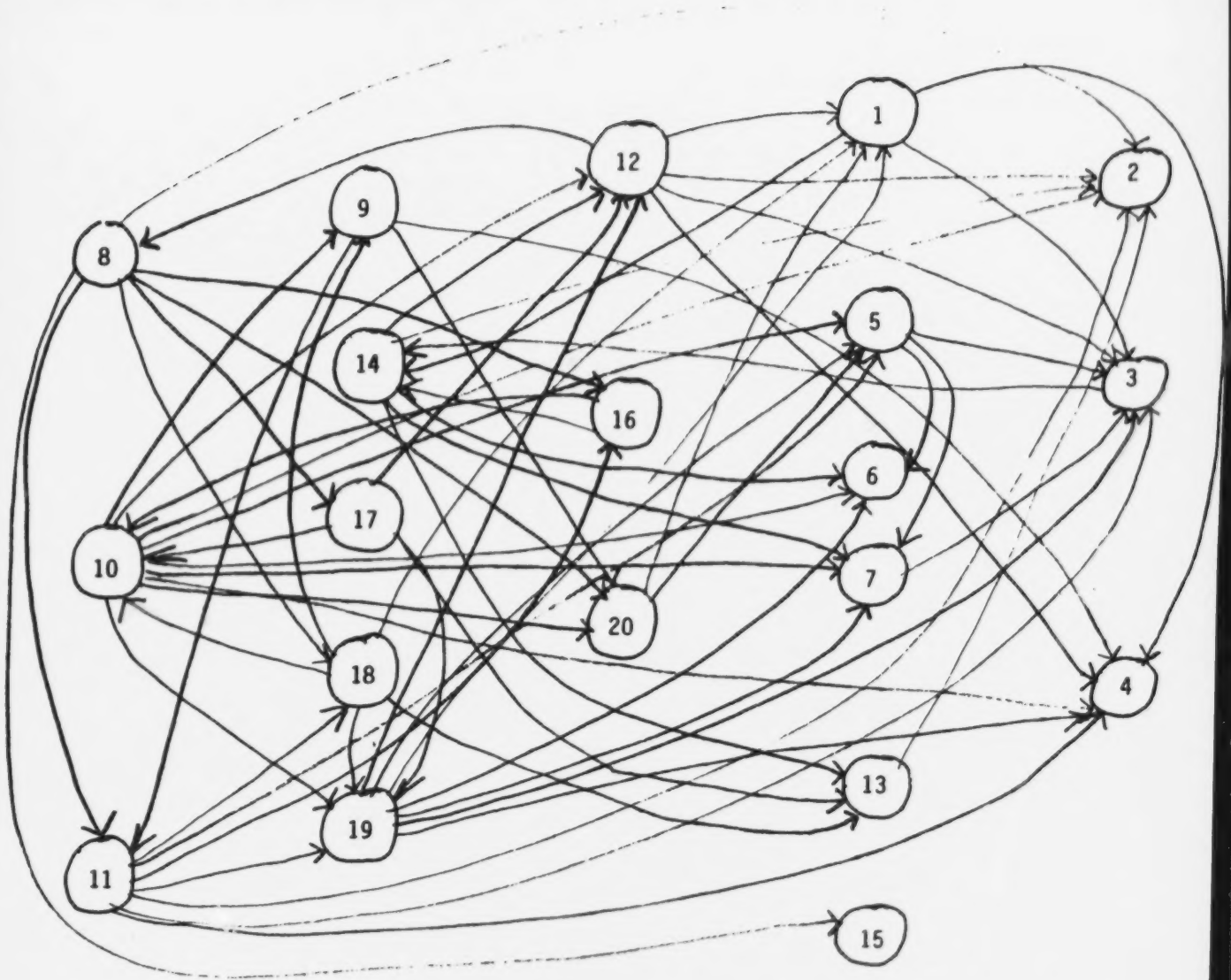


Figure B-5

Hierarchical Cause Map: Signed Diagraph

Table B-6

Role Emphasis Sheet

| Variable Number | Student | Self | Other Teacher(s) | Principal | District Office | Parent | Other | No Role Attributable |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | 1 |
| 2 | | | | | | | | 1 |
| 3 | 1 | | | | | | | |
| 4 | 1 | | | | | | | |
| 5 | 1 | | | | | | | |
| 6 | | 1 | | | | | | |
| 7 | | 1 | | | | | | |
| 8 | | 1 | | | | | | |
| 9 | | | | | | | | 1 |
| 10 | | | | 1 | | | | |
| 11 | | | 1 | | | | | |
| 12 | | | | | | | | 1 |
| 13 | | | | 1 | | | | |
| 14 | | 1 | | | | | | |
| 15 | | | 1 | | | | | |
| 16 | | | 1 | | | | | |
| 17 | | | 1 | | | | | |
| 18 | | | 1 | | | | | |
| 19 | | | | | | | | 1 |
| 20 | 1 | | | | | | | |
| Σ | 4 | 4 | 5 | 2 | 0 | 0 | 0 | 5 |
| % | 20 | 20 | 25 | 10 | 0 | 0 | 0 | 25 |

Table B-7

Cause Map Summary Sheet

1. Background Information

   A. Role: Grade 1

   B. Years in this school: 25

   C. Interacts with: H.M. 17, 16

      11, 24, 20, 6, 22

2. Causal Relationships

   A. Reciprocal Cause Maps

      1. Density of relationships

         - range of total in degrees: 22

         - % degrees in upper quartile: 10

      2. Reciprocity

         - % relationships that are mutual: 61

         - clusters that reciprocate (variables #s and content areas)

      3. % relationships negative: 8

      4. Highest total degree variable(s): 32

      5. Lowest total degree variable(s): 10

   B. Hierarchical cause maps

      1. Influences

         8, 11

         10

      2. Flow through

         19, 12, 14

      3. Ends

         2, 3, 4

Table B-7 (Continued)

3. Role Emphasis

| Category | Number | % |
|---|---|---|
| A | 4 | 20 |
| B | 4 | 20 |
| C | 5 | 25 |
| D | 2 | 10 |
| E | 0 | 0 |
| F | 0 | 0 |
| G | 0 | 0 |
| H | 5 | 25 |

Table B-8
Statistical Analysis Coding Sheet

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Import. | Influence | Recip. I | Recip. 0 | Hier. I | Hier. 0 | Σ Recip. | Σ Hier. | Δ-I | Δ-O | Δ-% |
| 1 | 5 | 17 | 15 | 4 | 2 | 32 | 6 | 13 | 13 | 26/81 |
| 2 | 5 | 11 | 5 | 6 | 0 | 16 | 6 | 5 | 5 | 10/66 |
| 3 | 5 | 12 | 7 | 6 | 1 | 19 | 7 | 6 | 6 | 12/63 |
| 4 | 5 | 13 | 7 | 6 | 0 | 20 | 6 | 7 | 7 | 14/70 |
| 5 | 5 | 9 | 7 | 4 | 2 | 16 | 6 | 5 | 5 | 10/63 |
| 6 | 5 | 10 | 7 | 4 | 1 | 17 | 5 | 6 | 6 | 12/71 |
| 7 | 5 | 10 | 7 | 4 | 1 | 17 | 5 | 6 | 6 | 12/71 |
| 8 | 5 | 9 | 16 | 1 | 8 | 25 | 9 | 8 | 8 | 16/64 |
| 9 | 5 | 13 | 14 | 2 | 3 | 27 | 5 | 11 | 11 | 22/81 |
| 10 | 5 | 9 | 14 | 3 | 8 | 23 | 11 | 6 | 6 | 12/52 |
| 11 | 5 | 5 | 10 | 2 | 7 | 15 | 9 | 3 | 3 | 6/40 |
| 12 | 3 | 5 | 6 | 4 | 5 | 11 | 9 | 1 | 1 | 2/18 |
| 13 | 3 | 6 | 4 | 3 | 1 | 10 | 4 | 3 | 3 | 6/60 |
| 14 | 5 | 5 | 7 | 3 | 5 | 12 | 8 | 2 | 2 | 4/33 |
| 15 | 5 | 6 | 5 | 1 | 0 | 11 | 1 | 5 | 5 | 10/91 |
| 16 | 5 | 7 | 8 | 2 | 3 | 15 | 5 | 5 | 5 | 10/67 |
| 17 | 5 | 6 | 9 | 1 | 4 | 15 | 5 | 5 | 5 | 10/67 |
| 18 | 5 | 5 | 8 | 2 | 5 | 13 | 7 | 3 | 3 | 6/46 |
| 19 | 3 | 6 | 9 | 4 | 7 | 15 | 11 | 2 | 2 | 4/27 |
| 20 | 5 | 7 | 6 | 3 | 2 | 13 | 5 | 4 | 4 | 8/62 |
| Σ | 96 | 171 | 171 | 65 | 65 | 342 | 130 | 106 | 106 | 212/62 |